

## Preface

*“Last Sunday I took my child to a soccer tournament. He is 7 years old and this was his first ‘real match’. I was on the terrace and was so excited to see him over there, standing in his green football strip, listening to his coach’s last advice with such an impressive seriousness. A number of parents sat on the steps with me, they all watched their children with similar feelings. A few minutes after the start of the match – I noticed he and his team mates were playing rather “spontaneously”: it was clear that they hadn’t been taught any schemes yet, or rules, so they ran randomly up and down the field, without any coordination. It was funny for us to see such a cheerful confusion, and of course, in the end, they lost the match. The following match was between two different teams and, at first, I was watching them without great care; but – slowly - my attention was drawn by one of the teams playing: the players were lined up on the field like soldiers, their first movements scanned by precise schemes and perfectly coordinated. Still, as the opposing team started coming forward and the match lit up, they seemed unable to invent on the fly schemes to follow the game, as if they couldn’t play outside the schemes they had been taught. In the end the team lost the match as well.”*

The above quote is Francesca Pozzi’s account of her own personal experience. The editors of this book regard this anecdote as a good metaphor of the problems and questions the book addresses, applied to the field of online collaborative learning. These include the following: how can we support a collaborative process, scaffolding it without constraining it? How can we balance rules and procedures with spontaneity and creativity? Many of us have experienced collaboration failures. Sometimes collaboration fails because people who are supposed to work together, hardly start to communicate with each other; sometimes because, even if group members are required to discuss and do so by zealously following given sets of rules, they do not really share or negotiate their ideas, but simply level their positions. The point is that collaboration isn’t easy to trigger, neither is it always successful.

However, collaboration is widely recognized as a catalyst of learning and creativity and – as such – collaborative learning approaches have become more and more popular and are regarded as desirable in those contexts where it is possible to set up the basic conditions for its delivery: they are adopted and promoted by academic institutions, companies, teacher training colleges, professional associations and schools, with the aim of making learning more meaningful, deep, and effective in the long run.

Besides, the widespread use of computers and the Internet at home, in the workplace and at school, and their ability to support communication and information sharing, has encouraged the adoption of collaborative learning approaches even at a distance. Since the 90s, the research field of Computer Supported Collaborative Learning (CSCL) has been attracting increasing attention focusing on how technology can enhance collaborative learning by supporting not only interaction among peers and groups, but also knowledge sharing among the members of a community.

This book focuses on those CSCL contexts where school or university students work online, usually through a CMC (Computer Mediated Communication) platform, and are subdivided into groups; each group is engaged in tasks (discussing a topic, solving a problem, studying a case, etc.) with concrete outputs to produce, which act as catalysts of interaction, collaboration and – in the end – of both individual and group knowledge building. In these contexts, the process is intrinsically learner-centered, as the teacher (or tutor, as the person in charge of the overall process is usually referred to) acts as mediator and learning facilitator. For several years the role of the tutor in CSCL processes has been thoroughly investigated: the tutors responsibilities, the methods to cope with large and diverse communities, the dos and don'ts of their way of dealing with possible problems, such as flaming, lack of participation, lack of convergence, etc. Even the tutoring styles have been put under the lenses of the CSCL researchers. Of course, it stands to reason that the tutor approach should be tailored to the learners' community, its features, background, previous experience and thereof ability to self-regulate. However, one firm point coming out from both practice and research, is that tutoring a learning community is a time-consuming and labour intensive, yet crucial task.

It is for this reason that, after the first phase of exploration of the tutor's role, a wealth of energy has been put into trying to devise methodological approaches and technological tools capable of easing and, whenever possible, guiding the tutor's work. Without this type of results, however large the acceptance of the theoretical principles may be, the culture of CSCL cannot become mature and best practice in this field cannot become as widespread as desired.

With these objectives in mind, several studies focused on how to support collaboration by providing a structure to scaffold group interactions, often starting from methods, tools and results consolidated in face-to-face settings. However, it soon became clear that even the question "how can I choose the right structure for a particular CSCL context" is probably not the right question. As a matter of fact, although it is largely acknowledged that the collaborative process needs to be supported, there is no clear idea among practitioners, nor consensus among researchers, on the extent to which it is advisable to support and "structure" collaboration.

This book addresses the issue of how to support collaboration in online learning communities by using techniques for structuring the learning activities, including the problem of whether, and to what extent these scaffolding methods are useful. The aim is to move one step forward in the direction of identifying criteria to choose the right approach, in the assumption and awareness that there is no such thing as the "one size fits all" solution, but rather a range of possible approaches among which it is important that instructional designers and tutors are able to choose. With this aim in mind, the book draws together, for the first time to our knowledge, the results of scattered research, concerning the most common techniques that can be used to structure collaboration in these contexts. The research efforts made so far in this field are large but quite diversified and in many cases their different standpoints make them hardly comparable or synergic. Even the research methods in this field are usually rather diversified, ranging from case studies to experimental work, from investigation of the effectiveness of one technique in specific contexts, to studies aiming to present and validate new methods and tools. This diversity is also testified by the terminological labyrinth that must be confronted before trying to make sense of the large number of chapters in this area.

In the following, therefore, we will try to disentangle the variety of standpoints adopted and terms used, not only in this volume, but in general, within the CSCL research field.

One of the issues mostly debated among researchers pertains the kind of delivery approaches for collaborative activities: many advocate the use of “blended approaches” (careful orchestration of face-to-face and online activities), as opposed to “purely online approaches”; yet others focus on the technology used to support interactions among learners: here the choice is between textual communication, video-conferencing systems, and software – emerged more recently – based on the use of 3D graphics environments.

At a finer level of detail, CSCL researchers and designers also discuss the nature of the activities they propose to students: in order to foster collaboration and exchange among peers, it is quite common in CSCL contexts to choose among collaborative techniques or strategies, usually borrowed (and adapted) by face-to-face contexts, such as for example the Discussion, the Peer Review, the Role Play, the Jigsaw or the Case Study. The report of experiences based on one or more of these techniques and the discussion of the observed results, is rather common in CSCL literature.

Moreover, in an effort to share practice and experience, not only among designers and researchers, but also with tutors/teachers, collaborative strategies and techniques are frequently described through more or less formalized languages. In particular, in the last few years the terms “Design Patterns (DP)”, “Collaborative Learning Flow Patterns (CLFP)” or “Pedagogical Patterns” – have been increasingly used by a number of researchers, to identify the description in natural language of collaborative techniques and strategies, proposed as reusable solutions of “recurrent problems”. Similarly, the so-called “Teaching Routines” are problem-oriented descriptions of collaborative techniques, where the focus is much more the role of the teacher while orchestrating the activities, rather than the tasks students have to perform. Here it is useful to stress the fact that the “communication objects” cited so far (i.e. DPs, CLFPs, Pedagogical Patterns, Teaching Routines, etc.), are all intended to allow communication among researchers, designers and tutors, while they are not – at least in principle - meant to communicate the activities to students.

Conversely, what is actually given to students to guide them through the collaborative activities, is called “script”. There are two types of scripts: “macro-scripts” and “(micro)-scripts”. The former are instructions, usually expressed verbally, containing the specification of the task to be performed, the time schedule of the activity, the team composition and the mode of interaction to be followed by students. The latter, the so called “(micro)-scripts”, are very specific instructions given to students (usually automatically, by the computer) to prompt them at various steps of the task. This is quite an important thread of research and it is often intertwined with the development of adaptive systems aimed at supporting collaboration.

Finally, a recent direction undertaken by some groups of researchers looks into what they call “content schemes” as tools to further scaffold collaboration among students. The content schemes are schematic representations of a framework for the expected output of students work (a table to fill in, or a document structure for the students to follow, etc).

The brief overview of the terms provided above, is synthesized in Figure 1. Most of the terms it contains are dealt with in one or more chapters of this book. The Figure is provided, so that the readers can better orient themselves among the topics of the various chapters.

Bearing in mind this rough map of the terms used in this book, we can take a closer look at the contents of the chapters.

The first four chapters (1 to 4) can be ideally gathered in a unique set, as they all propose reflections on the impact different types of structure have on the learning process.

Figure 1.

<b>Designers choose</b> <i>models / approaches</i>	<b>Designers instantiate</b> <i>strategies/techniques</i>	<b>Designers use</b> <i>formalisms to describe strategies/techniques</i>	<b>Designers /Tutors provide</b> <i>instructions for students</i>
<ul style="list-style-type: none"> <li>•Blended approach (Chap. 5; Chap. 7)</li> <li>•Mode of delivery (3D environments, web 2.0, videoconferencing) (Chap. 3; Chap. 4; Chap. 9; Chap. 16)</li> </ul>	<ul style="list-style-type: none"> <li>•Jigsaw (Chap. 5; Chap. 9; Chap. 18)</li> <li>•Role Play (Chap. 10)</li> <li>•Team Teaching (Chap. 10)</li> <li>•Three-step-Interview (Chap. 11)</li> <li>•Group Investigation Model (Chap. 11)</li> <li>•Progressive Inquiry Model (Chap. 5)</li> <li>•Think-Pair-Share (Chap. 11)</li> <li>•Co-op Co-op (Chap. 11)</li> <li>•Reciprocal Teaching (Chap. 5)</li> <li>•Case Study (Chap. 8)</li> <li>•Peer Review (Chap. 9)</li> <li>•Problem-based learning (Chap. 3; Chap. 7; Chap. 9)</li> <li>•Pyramid (Chap. 1)</li> <li>•Discussion (Chap. 1; Chap. 7; Chap. 9)</li> <li>•OP&amp;S (Chap. 6)</li> <li>•e-ARMA strategy (Chap. 14)</li> <li>•Annotation (Chap. 17)</li> </ul>	<ul style="list-style-type: none"> <li>•Design Patterns (DP) (Chap. 13; Chap. 15)</li> <li>•Collaborative Learning Flow Patterns (CLFP) (Chap. 12)</li> <li>•Pedagogical Patterns (PP) (Chap. 12)</li> <li>•Teaching routines (Chap. 13)</li> </ul>	<ul style="list-style-type: none"> <li>•Macro-scripts (Chap. 14; Chap. 15; Chap. 18)</li> <li>•Micro-scripts or prompts (Chap. 2; Chap. 4)</li> <li>•Content schemes (shaping the product) (Chap. 2; Chap. 3; Cap, 4)</li> </ul>
<p>Chapter 1 - Task, Teams and Time: three Ts to structure CSDL processes</p> <p>Chapter 2 - Supporting virtual collaborative learning using collaboration scripts and content schemes</p> <p>Chapter 3 - Fostering collaborative problem solving by content schemes</p> <p>Chapter 4 - Using and acquiring shared and unshared knowledge in collaborative learning and writing</p> <p>Chapter 5 - Blending educational models to design blended activities</p> <p>Chapter 6 - Models and strategies to support students' initial socialization in web-based learning environments</p> <p>Chapter 7 - Testing strategies to enhance online student collaboration in a problem-based learning activity</p> <p>Chapter 8 - Considerations for effective collaborative practice: A reflection on the use of case studies in on-line teacher education learning spaces</p> <p>Chapter 9 - Using the Four Lenses of Critical Reflection to Promote Collaboration and Support Creative Adaptations of Web 2.0 Tools in an Online Environment</p> <p>Chapter 10 - Using Role Play and Team Teaching as Strategies to Add Depth to Online Discussion</p> <p>Chapter 11 - Employing Collaborative Learning Strategies and Tools for Engaging University Students in Collaborative Study and Writing</p> <p>Chapter 12 - The role of CSDL pedagogical patterns as Mediating Artefacts for repurposing Open Educational Resources</p> <p>Chapter 13 - Teaching Routines to Enhance Collaboration Using Classroom Network Technology</p> <p>Chapter 14 - Assessing the Performance of Learners Engaged in Computer-Supported Collaborative Problem-Solving Activities</p> <p>Chapter 15 - Implementing computer-interpretable CSDL scripts with embedded assessment: a pattern based design approach</p> <p>Chapter 16 - The Support of Virtual 3D Worlds for enhancing Collaboration in Learning Settings</p> <p>Chapter 17 - From Active Reading to Active Dialogue: An Investigation of Annotation-Enhanced Online Discussion Forums</p> <p>Chapter 18 - Modelling, Enacting, Sharing and Reusing Online Collaborative Pedagogy with Cells</p>			

In particular, Pozzi and Persico (Chapter 1) claim that a structuring technique is not a mono-dimensional entity, but it is articulated into three main dimensions: Task, Teams and Time. Each technique tends to structure more heavily one of these dimensions, most often Task or Teams, rather rarely Time, but since these dimensions are not totally independent, the structure of the leading dimension often influences decisions on the other two. Of course, structuring techniques can be combined to better support the learning process on all three dimensions. The authors then report on the outcomes of an exploratory study where three groups of students carry out the same activity with support provided by different combinations of techniques along the three different dimensions.

Kopp and Mandl (Chapter 2) do not focus so much on how to structure strategies and techniques, as on how to structure instructions to be provided to students; in particular they discuss the use of collaboration scripts and content schemes as tools to scaffold collaboration. The chapter surveys a number of studies concerning the use of these tools and their effects on learning processes and learning outcomes, with the aim of providing the state of the art and identifying areas that deserve further research. The main conclusions are that, while these tools have proved effective in fostering content-specific cognitive processes and collaborative learning outcomes, there are at least two areas that need further investigation: the effects of these structuring methods on social processes and on individual learning outcomes. In addition, there is also a need for field studies that overcome the limits of present research, which is mostly based on experimental methods and therefore little suited to gain the insight we need into social processes and individual knowledge acquisition.

In the same vein, Helling and Ertl (Chapter 3) investigate the use of content schemes to foster collaborative problem solving in video-conferencing systems. The authors describe two situations where different content schemes are used to facilitate a collaborative problem solving activity, aiming to understand the impact of different content schemes on the learners' problem solving process and on the quality of the learners' problem solution.

Finally, Hron, Cress and Neudert (Chapter 4) report on an experiment of video-conference based collaborative learning, where the effects of scripts and content-schemes are also investigated. The experiment involved 30 dyads of learners engaging in the production of a collaborative artifact, and the main effects investigated concerned the extent to which students brought their unshared knowledge into the co-construct and this knowledge was actually shared with their partners, based on the social-psychological research paradigm of information pooling. The study outcomes sustain the hypothesis that the dyads supported with scripted content-specific visualization achieved a higher transfer of knowledge than dyads who did not receive instructional support and dyads who received support though content specific visualization only.

The second and larger set of chapters (chapters 5 to 13) reports on real life experiences of use of approaches, techniques and strategies and discuss the resulting learning processes.

In particular, Ligorio, Loperfido, Sansone and Spadaro (Chapter 5) propose and discuss a blended model for online collaborative activities. The model is based on the idea that, in order to gain the most from the socio-constructivist theoretical framework, it is useful not only to blend online with face-to-face activities, but also to mix different pedagogical techniques. After presenting some of the most common techniques, the authors describe an example of a course based on such a blended approach. The activities of the course have been tested in real contexts on university students and in-service teachers and some preliminary results are discussed in the chapter. This allows the authors to draw a set of useful recommendations for those who want to implement the model in contexts different from the original one.

Manca and Vanin (Chapter 6) propose strategies specifically devoted to support students' initial socialization in web-based learning environments. After discussing the role of socialization in learning processes, the authors concentrate on the importance of supporting learners' first steps within a learning environment and present a three-step guidance model named "Orienting, Preparing and Supporting" (OP&S). The application of the model can be concretized in guidance programs as a set of specific online and/or face-to-face activities that allow users to familiarize with technology, tools, resources and virtual places and to socialize with each other. The authors finally provide two different real-life examples where the OP&S model was implemented and propose their reflections on the model itself.

Lobry de Bruyn (Chapter 7) reports on prospects and problems usually faced in asynchronous Computer Mediated Communication (CMC) contexts and addresses the problem of identifying strategies to reduce the difficulties in using asynchronous CMC, especially in the context of problem-based learning within online environments. To this aim, the author presents an experience of online problem-based learning and investigates the impact caused by the early placement of a face-to-face meeting, held at the very beginning of the online activity. The chapter presents the results of content analysis of online discussions, supporting the inclusion of face-to-face teaching in online learning as a way to enhance online student collaboration in a problem-based learning activity.

The subsequent chapter, by McGhie-Richmond and Winter (Chapter 8), focuses on the use of case studies in on-line teacher education. Taking inspiration from an online collaborative project carried out in a Canadian Faculty of Education over two academic years, the authors provide a rationale for using online case studies to support student collaboration and the development of communities of practice, shedding light on both student and instructor factors that can contribute to successful online collaborative work. Finally, they provide an overview of the main challenges inherent in online collaborative work relative to case study analyses.

González-Acquaro and Preskill (Chapter 9) report on an experience, where the use of web 2.0 tools has been proposed in conjunction with some collaborative techniques ( Jigsaw, Peer Review, and others), in an online environment. During the experience, the four lenses of critical reflection introduced by Brookfield were used to design web 2.0 activities based on specific grouping techniques; the same lenses are also used by the authors in the chapter to propose their critical reflections on the overall experience.

The use of role play and team teaching as strategies to add depth to online discussion, is presented and discussed in the chapter by Lombard and Biglan (Chapter 10). In particular, the authors, after presenting the rationale behind the decision to adopt these techniques within an online graduate course, propose and comment data based on response and participation levels of students in two real experiences, the former based on a traditional discussion, the latter based on a discussion where the instructors assumed roles and discussed with students by playing these roles.

Daradoumis and Kordaki (Chapter 11) describe an experience where a number of collaborative strategies were at the same time object of study and method to be used by students to perform a collaborative activity. During this activity students are required to write an essay collaboratively and to elaborate a new collaborative strategy by combining some of those that were the object of study. The description of the activity is enriched with methodological and technological considerations on the overall learning experience and – more specifically - on the strategies proposed, on the way students built their own strategies combining the ones presented during the activity, and finally on the collaborative learning process and product.

Conole, McAndrew and Dimitriadis (Chapter 12) look at CSCL Pedagogical Patterns not only as strategies to support collaboration, but also – from an unusual perspective - as tools to repurpose existing

Open Educational Resources (OER) for collaborative learning. The idea presented in the chapter takes inspiration from a set of workshops held with educational technology experts, where it was shown that a small set of patterns drawn from a CSCL pattern language together with other Mediating Artefacts (such as visual representations of Learning Designs) may be inspirational and effective in repurposing existing OER.

Last of this second group of chapters, Haydel DeBarger, Penuel, Harris and Schank (Chapter 13) report on an experience based on the use of Teaching Routines to support ICT-based collaborative learning activities in the classroom. In particular, the activities object of the chapter are all based on the Group Scribbles classroom network technology. The authors reflect on the main implementation challenges on the basis of the Routines already designed for middle school Earth science.

The next set of chapters, consisting of two items (Chapter 14 and Chapter 15), focuses on the issue of how to evaluate and assess online experiences based on collaborative activities.

In particular, Retalis, Petropoulou and Lazakidou (Chapter 14) propose a framework to assess the performance of learners engaged in a collaborative activity based on a CSCL strategy and related script. The framework can be used with different CSCL scripts and is aimed at enabling the teacher to analyse the quality of students' product and performance, thanks to a list of specific criteria. The chapter then illustrates an exploratory experience carried out by the authors, where some of the indicators of the framework were adapted and used to assess a specific CSCL strategy (eARMA). The preliminary results of such experience are then presented, and they indicate the model as an effective way to support teachers in performing assessment of script-based collaborative activities.

Villasclaras-Fernández, Asensio-Pérez, Hernández-Leo, Dimitriadis, de la Fuente-Valentín and Martínez-Monés (Chapter 15) propose a CSCL script, based on a Design Pattern, which incorporates not only learning stages, but also steps specifically devoted to the assessment of the collaborative learning process itself. The chapter describes a case study conducted by the authors, which covers the whole life-cycle of the CSCL script with embedded assessment activities: starting from the design of the script, and ending with its implementation and instantiation. The case study shows the feasibility of this approach, and provides information about the requirements of CSCL script authoring tools to employ assessment and learning design patterns to support non-expert designers in those tasks.

The last set (Chapters 16 to 18) is oriented towards the study of the type of technology used: Gütl (Chapter 16) presents two experiences of collaboration carried out within 3D learning environments. In particular, after introducing collaborative learning in general and collaborative virtual environments, his first case study reports on the preliminary results obtained by observing university students working together in small groups within Second Life; the second study, instead, gives an overview of the preliminary results obtained by students working within an ad hoc 3D world enabling hands-on experiences. Overall findings suggest that such learning environments' advantages are a promising thread to be further explored. On the negative side, there are usability issues that may limit their impact in the short term.

Xin, Glass, Feenberg, Bures and Abrami (Chapter 17) describe "Marginalia", a software add-on to Moodle, allowing the use of the annotation technique as a way to support active dialogue and group knowledge building within a forum. After presenting the dynamics of online discussion and providing an overview of the most common problems one may face when using a traditional forum, the authors describe how Marginalia can overcome such problems. The article concludes with an analysis of two trial classes employing Marginalia, which highlights that a number of uses of this technique are possible, some of which rather unexpected.

Finally, Ronen and Kohen-Vacs (Chapter 18) illustrate “CeLS”, a web-based environment allowing teachers to create and share CSCL activities based on collaborative scripts. After presenting the overall CeLS approach, two common examples that demonstrate the use of CeLS for designing and enacting CSCL scripts are presented. A focus is then proposed on two specific functionalities offered by the environment: the CeLS “shared document editing” and “grouping by inputs”. In the end the authors describe how a teacher could use the environment and illustrate its main potential and challenges.

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